

XVI. *On Sexual Dimorphism in the Rutelid genus Parastasia, with descriptions of new species.* By GILBERT J. ARROW, F.E.S.

[Read October 4th, 1899.]

PLATE XVII.

IN a paper dealing with the *Anomala* group of Rutelidæ recently published in the Transactions of the Entomological Society, I pointed out the importance in systematic work of ascertaining what characters were sexual. A study of the Asiatic Rutelidæ constituting the *Parastasia* group has strongly emphasised this necessity and shown the worthlessness, in the present family at least, of much of the work in which this point has been neglected.

Having made a preliminary separation of the specimens of *Parastasia* in the British Museum collection upon the basis of Westwood's Monograph of the genus, I was surprised to find an almost entire absence of external sexual differences, and dissection proved that this was due to the fact that the greater number of the apparent species consisted of one sex only. I afterwards found that the existence of sexual dimorphism in this genus had already been noticed by Dr. Ohaus in a recent paper in the *Stett. Ent. Zeit.* As however this author has not fully recognised the extent of the dimorphism, and as I have been able to examine a number of types unknown to him and a large number of specimens of new and old species, several collections having been kindly lent me for the investigation of this interesting phenomenon, I have thought it desirable to collect together all the instances I have been able to discover, including those already pointed out by him. I shall adhere as far as possible to Dr. Ohaus' subdivisions of the genus.

This group of Rutelidæ includes several remarkable genera, such as *Peperonota*, *Fruhstorferia* and *Didrepanophorus*, characterised by extraordinary differences between the sexes, and it is interesting to find the well-known predominant genus exhibiting the same phenomenon, so long unexpected, in many different ways.

The genus *Parastasia* was originally characterised by Westwood, as he says, "from a female of *P. canaliculata* and a male of *P. Westwoodii*," those sexes of the two species alone being known to him. These two insects represent in a wide sense the opposite extremes of this comprehensive, but sufficiently well-defined, genus, and between them may be ranged forms which have hitherto been regarded as constituting different generic types. As might be expected therefore, the generic characters so far as they are sexual, are wholly incorrect. The male of *P. canaliculata* has remained unknown, Dr. Ohaus stating that he knows only females, whilst two specimens, besides the type (which I have been able to examine), are also females. Another insect however, *P. bipunctata*, described by Westwood from the same collection of Philippine beetles, consists only of males, all the specimens in the British Museum, including the type, being of that sex, and Dr. Ohaus also indicating that the female is unknown to him. The two insects are similar in form and size, the chief differences being that the body, especially the prothorax, is more parallel-sided in the first (*P. canaliculata*, of Westwood), the propygidium not shining, and especially that a part of the yellow fascia is elevated above the general surface of the elytra and has a deep groove on each side of the scutellum. All these peculiar features, in view of those which will be referred to in other species, seem to point to the fact that the two are the sexes of the same species, and looking at all the evidence I have no hesitation in stating this to be the case. In the structure of the claws, as in other features by which the sexes of Rutelidæ are usually distinguished, these two forms are practically identical, nor are the remarkable differences which I have mentioned, like others which I shall refer to later on, known to occur in any form in any other group. The genus *Parastasia* is therefore highly peculiar, and indeed other structural features show it to occupy a very isolated position.

Parastasia canaliculata, the type of the genus (vide the original description, Ann. Nat. Hist., 1841, viii, p. 204) belongs to the 3rd group of Dr. Ohaus, forming the preponderating section of the genus, in which there is no constant external character distinguishing the sexes, but a variety of differences in different species. In *P. rufopicta*, an insect closely related to the previous one, a remarkable

difference already pointed out by Dr. Ohaus, occurs in the propygidium, which in the female has a peculiar microscopic structure producing a dull sooty or velvety surface, while in the male it is rather shining and does not differ in structure from the rest of the surface of the abdomen. Another slight difference, interesting as throwing light upon *P. canaliculata*, is that the elytra of the female have a distinct depression limited by the hinder border of the pale fascia, giving this the appearance of being partly elevated above the general level.

In a new species very near these the female is distinguished by a very slight opaque area bordering the scutellum, recalling both the opaque propygidium of the same sex in the last species and the scutellar grooves of *P. canaliculata*. It also differs from the male both in the sculpture of the propygidium and of the elytra and in the form of the markings.

Parastasia birmana, sp. n. (Plate XVII, figs. 3 and 4.)

Nigra, nitida, elytris fulvo-maculatis, corpore subtus fulvo-hirto; capite grosse punctato, quadridentato; prothorace haud dense, antice grossius, punctato, utrinque bifoveolato; scutello fere impunctato; pygidio et propygidio dense striolato, illo bifoveolato; tarsorum mediorum et posteriorum unguibus externis profunde bifidis; ♂ elytris subtiliter sublineato-punctatis utroque macula humerali ~-formi punctaque parva apicali flavis ornato; ♀ elytris politissimis, impunctatis, macula superiori expansa, ad margines basalem scutellarem et suturalem attingente; prope scutellum margine tenui opaco; propygidio subtilissime striolato. Long. 22 m.m.

Hab. BURMA (*Bowring*); YUNNAN (*Oberthür*).

This species is intermediate in general appearance and the character of its markings between the two previous ones and is interesting as combining the sexual distinctions of a number of allied forms. In the expansion of the yellow fascia in the female it resembles the next species.

P. basalis, Cand., of which the sexes, regarded as specifically different by that author, have been associated by Dr. Ohaus, exhibits many differences. The female, as is very generally the case in the genus, has a somewhat different form owing to its greater parallel-sidedness, the elytra, unlike those of the male, are almost entirely unpunctured and the red humeral band extends to the middle, whereas in the male it is shorter and more inter-

rupted. The pygidium, which in the latter sex is quite bare, is thickly clothed with yellow hairs and, as is also frequently the case in *P. canaliculata*, the prothorax is normally quite black in the female and in the male a more or less deep shade of red. But the most interesting difference, although not an invariable one, is that each elytron of the female usually exhibits one or more deep furrows or scratches bordering the scutellum, less conspicuous but of precisely the same nature as those of *P. canaliculata*. There are sometimes as many as four or five of these on each side and occasionally they are quite absent.

P. sumbarwana, Ohaus, is another related insect of which the sexes are very distinct. By the kindness of the describer I have been able to examine the type, which, like several similar specimens I have seen, is of the male sex; but in M. René Oberthür's collection, in addition to two specimens of this form, there are four females found with them at Sumbawa which, instead of having the reddish tawny coloration of the male, are black or very dark brown with orange markings on the elytra, consisting of an irregular fascia below the scutellum and an apical spot, very similar to the markings of *P. canaliculata*. The present insect however is smaller than that species, more convex, and less shining, with distinct striation of the elytra and the thorax punctured all over. In these respects it corresponds with the male, in some specimens of which similar paler markings can be faintly traced.

The following new species of this group are also dimorphic. The first, *P. cingala*, is closely related to *P. basalis*, the sexes differing in the pygidium being similarly clothed with hair in the female.

Parastasia cingala, sp. n.

Valde convexa, nigra, nitida, prothorace fasciaque serrata sub-humerali coralinis; capite rugoso-punctato; prothorace punctato, utrinque foveolato; scutello fere lævi; elytris leviter sulcatis atque punctatis; pygidio subtiliter striolato nudo; ♀ prothorace crasso, grosse punctato, fascia elytrali latiora sed neque ad margines attingente, elytris sat evidenter sulcatis et punctatis, pygidio hirtis. Long. 13—15 m.m.

Hab. CEYLON: Colombo.

This insect, at least in the male sex, closely resembles

P. basalis, but is smaller, with the elytral band in both sexes narrower and the prothorax a bright coral red.

Parastasia timoriensis, sp. n. (Plate XVII, figs. 7 and 8.)

Cylindrica, laevis, nitida (♂ rufo-brunnea, ♀ nigra), macula circumscutellari flava; capite rugoso, prothorace sat grosse punctato, postice dilatato (♂ praecipue), scutello subtiliter, elytris haud, punctatis, pygidio subtilissime striolato. Long. 18 m.m.

Hab. TIMOR (*Doherty, Wallace (Hope Museum), etc.*).

The sexes in this species are closely alike except in colour. The yellow elytral mark shows no variation in the specimens which I have examined. It reaches the anterior, scutellar and sutural margins but not the lateral border and has a right-angled notch on each elytron. It is relieved in the male by a black posterior edge which merges into the reddish-brown ground colour. All the specimens I have examined are from Timor with the exception of one in the Oberthür collection from the small neighbouring island of Lomblem.

In this section should also be placed *P. andamanica* of Dr. Ohaus, who, knowing only the male, placed it in his "confluens group." Misled by this I at first regarded the insect, of which the female differs entirely in appearance from the form described by Dr. Ohaus, as a new species, but a subsequent perusal of the description led me to suspect the truth, and I have since been enabled to see the type. I shall allow my description to stand however, as the species is as yet quite inadequately described.

Parastasia andamanica, Ohaus, Stett. Ent. Zeit., 1898, p. 13. (Plate XVII, figs. 5 and 6.)

Cylindrica, parum nitida (♂ rufo-brunnea, ♀ nigra), macula humerali fulvo-rufa malleiformi; capite fortiter rugoso, acute quadridentato; prothorace ubique fortiter punctato, utrinque foveolato; scutello subtiliter punctato; elytris regulariter ac fortiter punctato-striatis interstitiis subtilissime (2° grosse) irregulariter punctatis, singulo elytro macula obliqua ad scutellum transverse expansa; pygidio subtiliter transverse rugoso-striolato; ♂ capite fusco, dentibus superioribus minus acutis; prothorace minus gibbo, laete rufo-brunneo, linea media subelevata; scutello, elytris corporeque subtus paulo obscurioribus, macula indistincta. Long. 12—17 m.m.

Hab. ANDAMAN IS.

This insect varies very considerably in size but otherwise very little. It is the most strongly punctured species known to me in this section of the genus. It is easily recognised by the orange-coloured mark shaped like a hammer upon each elytron.

P. bicolor, Westw., the type of which is in the British Museum, and which Dr. Ohaus has wrongly stated to be identical with *P. femorata*, Burm., is a very distinct species also belonging to this group. It is unfortunate that Dr. Ohaus has called the section to which the latter insect belongs (the gen. *Cælidia* of Dejean) "the bicolor group." The original of this sub-genus, from Dejean's collection, will be described later. *P. bicolor* resembles *P. femorata* in coloration but is very different in structure and easily distinguished by its much larger size, more rectangular form and naked legs and pygidium. The two sexes are alike. This is one of several cases in this genus of superficial resemblance between species not nearly related.

P. binotata and *P. Horsfieldi* are two more insects simultaneously described by Westwood from the same part of the world (Java) of which the first appear to be all females and the second all males. The type of the former is unknown, and I have only seen two specimens, which are both females, but the type of the latter and a number of other specimens which I have examined are all males. This confirms Dr. Ohaus' suggestion that these are the sexes of one species; and as they are almost alike except that the female is quite black with a round spot on each elytron near the scutellum, and the male uniformly dark brown, and as no other similar form is known from the same island, this is in all probability correct. In this case the name will become *P. binotata*, Westw., that form having been first described in Westwood's paper. The insect described by Burmeister from Dupont's collection as *P. binotata*, Westw., is entirely different, as shown by his reference to a serial puncturation on the elytra and *sinuated* pale marks. To avoid confusion this species may be re-named *P. Duponti*. M. Oberthür possesses an insect from Southern India formerly in Van Lansberge's collection (which included that of Dupont) and labelled by the latter "binotata, Burm., type." I have seen six specimens of the insect, which is of a deep mahogany colour, and all are males.

Very near the male form of *P. binotata* is the male

P. niasiana, Ohaus, which is in my opinion the missing counterpart of *P. ephippium*, v. Voll., to which it stands in exactly the same relation as does *P. Horsfieldi* to the first, except that the elytral mark is not absent but is of a darker colour. In the type of *P. niasiana* this is of the same shape as in *P. ephippium* except that its anterior process does not quite reach the margin of the elytron; but, from the general terms in which Dr. Ohaus has referred to it, it may not be alike in all specimens. The pygidium, as in the preceding species, is less sharply striolated in the male than in the female form and does not show a smooth median ridge. In all other respects, except the greater parallel-sidedness almost invariably characteristic of the female and the slight interval between scutellum and elytra to which Dr. Ohaus has called attention in *P. ephippium*, and which is evidently a female character, the two are identical. The type of *P. ephippium* was brought from Sumatra, Dr. Ohaus's specimens are from Nias, and two females in the British Museum are from Penang.

An interesting new species may be described here, although only one sex is known, as it seems to form a link between the present section of the genus and those distinguished, together with other characters, by a long mesosternal process. It also exhibits in a more marked degree the strange opaque area described in *P. birmana*, and distinctive of the female.

Parastasia circumferens, sp. n.

♀ Crassa, nigra, nitidissima; capite rugoso, acute quadridentato; prothorace lateribus disperse, antice fortius, punctato, utrinque fortiter foveolato; scutello elytrisq̄ue politissimis, his prope scutellum sat late opacis; pygidio cum propygidio subtilissime striolatis, illius linea media apiceq̄ue nitidis; processu mesosternali valido acuto; tarsorum mediorum et posticorum unguibus divisis. Long. 21 m.m.

Mas incognitus.

H ab. PENANG (*Lamb*).

This insect presents a deceptive resemblance to *P. ephippium*, which occurs in the same locality, and until I had ascertained it by dissection to belong to the same sex I believed them to be the two forms of the same species. In size, form and surface the new species exactly resembles the old and it shows no structural distinction except in the

prolongation of the mesosternum, although the absence of the yellow markings and the peculiar sooty band surrounding the scutellum make it easily distinguishable. It would not have been described but for the interest attaching to it as demonstrating the little systematic importance in the degree of development of the sternal process, which has been made the occasion of generic separation. The very close relationship of this species to others in which the process is almost absent is strikingly evident.

In *P. heterocera*, Ohaus, which represents Dr. Ohaus' 8th section, the sexes differ typically by the males having the elytra scarlet, sometimes with more or less black at their base, whereas the female is wholly black. The insects of this section are very variable, however, in coloration, and Dr. Ohaus mentions an exceptional female specimen with red elytra. Another in the British Museum shows a trace of red, while several males are entirely black. These exceptions however only indicate that the rule is not invariable. There is another, and probably invariable, difference in the form of the anterior horns which in the male are separate and parallel and in the female converge in a right angle at the base.

P. dimidiata and *nitidula* of Erichson are closely related to this. Dr. Ohaus mentions that all his specimens of the former are females. A search for the male has revealed it in *Urleta ometoides* of Westwood. The type of this was collected by Wallace, together with two specimens of *dimidiata*, at Singapore, and a slight comparison shows them to differ only in coloration and in the cephalic armature, the points by which the sexes of the previous insect are distinguished. In order to confirm my opinion I dissected the specimens mentioned above, which are contained in the Oxford Museum, and demonstrated Westwood's insect to be a male and those collected with it females. It may be mentioned that Westwood did not recognise the latter as *P. dimidiata* (although he had himself published the description of this in an Appendix to his own Monograph), but evidently selected the more conspicuous insect for description without any examination of the others, and of course without any knowledge of the sexual peculiarities of the genus.

Erichson's type, as well as the females in the Oxford Museum, are black with the pygidium and the posterior half of the elytra red. The male is red with the exception

of the head and the anterior half of the elytra which are black, the red posterior part being paler at the extremity. Dr. Ohaus mentions a female coloured practically like this, which is probably exceptional but affords further proof of their specific identity. The structure of the horns in the two sexes is however probably constant, the male showing the same difference as in *P. heterocera* but with a somewhat greater development. Under these circumstances Westwood's name will of course have to give place to that given by Erichson.

Erichson's description of the related *P. nitidula* is from a male specimen, as shown by the form of the cephalic processes. The only corresponding specimen I have seen is in M. Oberthür's collection, which also contains two individuals of the other sex, a third being in the British Museum. These three females agree in having an apical orange band upon the elytra, the male being without marking. The coloration of the sexes thus reverses the condition prevailing in *P. heterocera*, which is very remarkable considering the intimate structural relationship of the two. In the three closely related species, *dimidiata*, *heterocera* and *nitidula*, we accordingly find the elytral band occurring normally in the male only in one, in both sexes in another, and in the female only in the third. *P. nitidula* may prove to be variable, like the other two, in coloration, but the normal condition seems to be sufficiently indicated by the five known specimens. Both sexes of this species are distinguished by the bronzy lustre upon the elytra, no other known member of the genus being in any degree metallic.

These three species form a section of the genus differing from the previous one in no important particular but the greater development of the cephalic and mesosternal processes. Another section consists of species in which these are not prolonged but the structure of the claws differs entirely in the two sexes, those of the male being as in the last two sections, while in the female they are all undivided. To this group belongs the commonest species of the genus, *P. confluens*, Westw., the sexes of which previously separated as *pilea* and *rugosicollis* have already been brought together by Dr. Ohaus. In this insect, besides the difference in the claw-structure, there is a striking difference both in colour and sculpture, the females being deeply striated and almost black in colour, with the

exception of two clearly defined yellow patches on the elytra, and the males nearly smooth and of a more or less light mahogany colour into which the pale markings partly melt. Of several apparently allied species the males only have been described.

Another insect in which the sexes exhibit similar differences is *P. discolor*, Westw., an insect described from the Philippine Is. of which the type is a male. A series of specimens of the same sex in M. Oberthür's collection exhibit all gradations from this form, in which, of the upper surface, only the head, scutellum and a very narrow line bordering the elytra are black, to one in which only the thorax remains red. From the light forms of this I cannot distinguish *P. scutellaris*, Erichs., described from Sumatra. A specimen in the British Museum is from Penang and brought with this insect is a female which I believe to be the same. A similar one was taken with M. Oberthür's Philippine specimens. This female form is strikingly different in appearance, being entirely black, rather larger and more parallel-sided than the male and coarsely striately punctured. The claws differ in the two sexes as described above. This appears to be a somewhat common type of female in the genus, those of several species being extremely similar.

Of the two following new species related to *P. discolor*, *P. unicolor* exhibits a similar sexual disparity in coloration, and the sexes of *P. alternata*, a very conspicuously coloured insect, differ only in claw-structure.

Parastasia unicolor, sp. n. (Plate XVII, figs. 11 and 12.)

Convexa, nitida, capite prothoraceque grosse, hoc postice rarius, punctatis; scutello vix punctato; elytris lineato-punctatis; ♂ fulvo-brunnea, capite, pedibus, corpore subtus marginibusque omnibus prothoracis, scutelli et elytrorum tenuissime fuscis, undique subtiliter punctata, pygidii medio levi; tarsorum mediorum et posteriorum unguibus divisis. Long. 16 m.m.

♀ tota nigra, plus elongata, fortius punctata, pygidio subtiliter striolato; unguibus omnibus simplicibus. Long. 18 m.m.

Hab. N. BORNEO: Sandakan; Elopura.

This insect is exceedingly closely allied to *P. discolor*, Westw., and indeed the black females are hardly distinguishable, but the males are at once separable by their

colour which does not vary in a considerable number which I have examined.

Parastasia alternata, sp. n.

Crassa, fulvo-rufa, capite, scutello, fasciaque transversa humerali partem anteriorem tertium vix obtegente, pedibus corporeque subtus plerumque nigris, margine tenuissimo prothoracis elytrorum pygidique fuscescente; capite grosse, prothorace subtiliter, punctatis, scutello fere impunctato, elytris leviter sulcatis et punctatis, pectore fulvo-hirto, processu mesosternali brevissimo, abdomine striolato; ♂ tarsorum mediorum et posteriorum unguibus divisus, pygidio nitido vix punctato; ♀ unguibus omnibus simplicibus, pygidio grosse punctato. Long. 20 m.m.

Hab. N. INDIA: Allahabad (*Bowring*).

The black *P. vitiensis*, Nonf., as already discovered by Dr. Ohaus, is the female of *P. dolens*, Fairm., which, with *P. melanocephala*, Burm., he has regarded as constituting a separate section on account of the elongate club of the antenna. The male of *P. dolens*, however, is very variable and has a tendency to assume the female coloration. It is normally red, somewhat darker on the elytra, and with three longitudinal black stripes on the prothorax. Two specimens in M. Oberthür's collection, however, have the elytra black and a third has entirely assumed the black colour of the other sex. *P. melanocephala*, Burm., hardly differs sexually in colour, but it and *P. dolens* both show the same difference in the claws as the insects just described.

Another group consists of insects in which the sexes show the same difference in claw-structure, as well as a colour difference, but in these there is a long acute mesosternal process. These constitute the *vittata* group of Dr. Ohaus, who has announced the black *P. atra* to be the female of *P. vittata*, in which the prothorax has a red border and median line, which I have no doubt is correct. The length and form of the sternal process vary very considerably in this species.

P. helleri, Ohaus, of which the female is as yet unknown, is a very nearly related insect.

To this group also belongs *Echmatophorus Pascoei*, Waterh. (Plate XVII, figs. 1 and 2), the original specimens of which being of one sex only were placed in a new genus by Mr. Waterhouse, owing to the distinctive form of the male, produced by the short and broad prothorax, and the presence of the long sternal process, the

existence of which in other species of *Parastasia* he was not then aware of. I have identified the female of this insect in a specimen * which clearly connects this section of the genus with the succeeding one. This female presents a remarkable resemblance, not only in its short ovate form and its simple claws, but also in sculpture and coloration, to the typical form of that group, *P. bimaculata*, Guér. Its right determination is sufficiently evident, however, from the sharp downward curved thoracic spine, the black scutellum and the rounded black spot upon the pygidium, in all of which it exactly agrees with the male *Parastasia Pascoci*. The female has two squared spots on the posterior part of the prothorax, as in *bimaculata*, which in the male unite together and with the black scutellum to form a large heart-shaped mark.

These differences both in bodily form and marking occasion a dissimilarity between male and female which is very remarkable; but still more extraordinary is an undescribed species allied to this in which the two sexes differ not only in form, marking and the structure of the claws, but also in a striking degree in the form of the mesosternum and the sculpture of the elytra. Indeed so complete is the distinction that I long hesitated to associate the two. Considering, however, that all the differences here occurring in combination have already been found in other representatives of the genus, except one, viz. the presence of a long sternal process in the female only, and as the degree of development of this structure has been found to have no systematic importance, distinguishing species closely related, and varying within the limits of a single species, there seems no valid reason for resisting the evidence which points to the identity of the two forms. Four specimens acquired by M. Oberthür from Van Lansberge's collection were taken in the same locality and of these two of different sexes were, judging from the labels, taken simultaneously. Three specimens without a sternal process show no variation and are all males, while the fourth, with a process, is a female and shows an evident relationship, in colour and marking, to the male. I propose to call this insect *Parastasia mirabilis*.

* NOTE. This specimen, collected by Wallace at Singapore, was found in the Hope Collection at Oxford, but has been transferred to the British Museum, and a co-type of the male form is now in the former collection.

Parastasia mirabilis, sp. n.

Rufo-flava, capite, maculis prothoracis et scutelli corporeque subtus nigris; capite bituberculato, rugoso; prothorace leviter, scutello vix, punctatis; elytris striato-punctatis. ♂ cylindricus; corpore subtus et scutello toto nigris; prothoracis basi macula nigra tridentata ornato; elytris rufis, regulariter striato-punctatis; pygidio lateribus leviter striolato; mesosterno parum producto; tarsorum 4 posteriorum unguibus externis divisis. ♀ lata, depressa, pallidiora; corpore subtus plus minusve, prothoracis et scutelli maculisque minoribus nigris; singulo elytro disco profunde trisulcato, prope scutellum rugoso et ad lateris medium subtiliter transverse striato; mesosterno valde producto; unguibus omnibus simplicibus. Long. 18 m.m.

Hab. MALACCA.

The male exactly resembles that of *P. Pascoei* in its rather peculiar coloration, but is more elongate, the sternal process is almost absent and the thoracic mark is produced forwards in the middle. The female is broader and less convex, with a sternal process like that of *Pascoei*, and the sculpture of the elytra is highly remarkable. The puncturation is almost obliterated but there is a finely striated area in the middle of each side, the angles adjoining the scutellum are rugose, and in the middle of each elytron are three deep longitudinal furrows placed close together and about one-third the length of the elytra.

The next group, represented by the common *P. bimaculata*, has all the claws quite simple, in the male as well as the female, and the mesosternum is not produced. In the typical species the sexes show no conspicuous difference, but a closely related species by which it is represented in New Caledonia and the New Hebrides has very distinct sexual forms. This is *P. Percheroni* of Montrouzier (Plate XVII, figs. 9 and 10), who correctly associated the two forms but, being ignorant of sexual differences, regarded them as due only to the age of the specimens. He has therefore unconsciously described accurately the two sexes of the species, that which he regarded as the extreme pale variety being the male. Besides the colour differences described by him, this has a somewhat longer antennal club and the prothorax is very different in shape, being smaller, less convex, and sharply angulated at the sides. The female varies greatly in coloration, but according to the considerable number of specimens I have examined in

various collections, even the palest individuals have a black scutellum, two spots on the thorax and bars on the pygidium of the same colour, all of which are absent in the males.

This insect has been commonly regarded as identical with the variable *P. bimaculata*, but the recognition of the pale form as the male will show the range of variation to be much less than has been supposed and render the two species immediately recognisable. The geographical distribution of *P. bimaculata* seems to me to be much more restricted than is at present supposed. The New Caledonian insect, besides the black scutellum of the female and the absence of markings in the male, is distinguished by its larger size. Smaller forms occur in which the scutellum is black, but these will probably be found to be also specifically distinct from *P. bimaculata*.*

A very prettily marked little insect belonging to this division is *P. Carolinæ*, Gestro, the position of which is suggested by the two-spotted thorax. A specimen in the British Museum is a male and has all the claws simple, a condition which so far as is known occurs in this sex in no other group of the genus. It appears to me highly probable that the other sex of this insect, which inhabits New Guinea, is the female described by Dr. Ohaus from that island as *P. Weberi*, which is a black form agreeing in size and sculpture as well as in the formation of the claws.

P. marginata, Boisd., which seems to occupy an intermediate position between this section and the next, agrees with no other known species in claw-structure. All the tarsi have divided claws in the male, and only the second and third pairs in the female, as also occurs in the next group, which, however, is strongly differentiated from all the rest of the genus by the form of the middle tarsi of the male. Of sixteen individuals of *P. marginata* which I have examined in the British and Oxford Museums only one, an entirely black insect, is a female. Of the males three are testaceous, the head and tarsi only being of a rather darker tint, and the rest have the head, a mark of

* NOTE. Dr. Ohaus has mentioned the Philippine Is., as well as the New Hebrides and New Caledonia, as included in the habitat of this species, but the true *bimaculata* does not appear to me to occur in any of these islands. The Philippine form is *P. nigriceps*, Westw., a much smaller insect with hardly visible puncturation.

the shape of a mulberry leaf on the thorax, the scutellum and the sides and extremity of the elytra black. The pale variety may be due only to immaturity, for the species does not seem to be a variable one. The apparent rarity of the female accounts for its having remained hitherto unknown. *P. marginata* has been recorded only from New Guinea but was collected by Wallace also in Mysol and Waigiou.

The type of the last section of the genus (the "*bicolor*" group of Dr. Ohaus) is *P. Westwoodii*, Westw., the sexes of which differ only in the remarkable character referred to above, which is common to the whole group. In the male the tarsi of the second pair of legs are very much thickened and shortened, the last joint is extremely large, and the inner division of the outer claw is expanded into a broad blade. This structure was described and figured by Westwood, who did not observe however that the inner side of the last joint is strongly hollowed out and that there is a strong projection from the inside margin of the preceding joint which meets the lobe of the claw. The whole modification thus forms a perfect hollow grasping structure. Such a modification of the middle tarsi is highly remarkable and makes this division of the genus the most distinct of all, and did not the constancy of many essential characters in all these insects render it most natural to retain them all within a single comprehensive genus the present group might be generically separated with much more reason than those forms which I have merged into the large genus.

This section constitutes the old genus *Cælidia* briefly characterised by Burmeister from a still undescribed species in Dejean's collection supposed to be Australian. The original specimen labelled "*Cælidia quinquemaculata*, hab. in Nov. Holl." is now in the British Museum and proves its association with *nigromaculata*, Bl., in the Munich Catalogue to be entirely erroneous. A similar male specimen in the British Museum was collected by Dr. Horsfield in Java, and M. Oberthür possesses the female from the same island. Both Dejean's locality and that cited by Gemminger (New Guinea), probably by way of improvement, are therefore no doubt wrong. To clear up the confusion I shall describe this insect under the name given to it by Dejean.

Parastasia quinquemaculata (Dej., M.S.), sp. n.

Ovata, paulo depressa, nigra, prothorace elytrisque (maculis exceptis) rufis, maculis 2 prothoracis disco, 2 humeralibus et 1 magna scutellari; capite vix dentato, haud profunde punctato; prothorace undique disperse punctato; scutello fere impunctato; elytris subtiliter lineato-punctatis; pygidio punctato, cum pedibus longe fulvo-hirto. ♂ tarsis intermediis crassatis, ungue externo lobato. ♀ tarsorum anticorum unguibus simplicibus. Long. 12 m.m.

Hab. JAVA.

This insect, with its bright red upper surface and five large black spots, is quite unmistakable. Except in the tarsi the three specimens, representing both sexes, which I have examined are identical, although Dejean's example is somewhat immature and has the spots and lower surface reddish.

I have already pointed out that the species called *bicolor*, Westw., by Dr. Ohaus belongs to this group, whereas the true *P. bicolor*, Westw., belongs to the "rufopicta group." The former should therefore be called *P. femorata*, Burm. According to Dr. Ohaus it is very variable, but the male is chiefly red and the female generally quite black.

The following is nearly allied to *P. nigripennis*, Sharp, regarded by Dr. Ohaus as a variety of *P. femorata*, but as the British Museum possesses a fairly large series of specimens from three different collections, showing practically no variation, it must be regarded as a permanent form. The two sexes are alike except in the structural character referred to.

Parastasia ruficollis, sp. n.

Ovata, nigra, prothorace, coxis femoribusque anticis (intermediis posticisque interdum) rufis; capite prothoraceque irregulariter punctatis; scutello fere impunctato; elytris fortiter lineato-punctatis; pygidio punctato, cum pedibus longe fulvo-hirto. ♂ tarsis intermediis crassatis, ungue externo lobato. ♀ tarsorum anticorum unguibus simplicibus. Long. 12 m.m.

Hab. JAVA, SINGAPORE.

This insect is black with the exception of the prothorax and parts of the legs; whereas *P. nigripennis* is described as red with the exception of head, elytra and markings on the legs.

P. Burmeisteri, Ohaus, is a species of this group differing sexually in a very remarkable way. The male of this has been described under the name of *P. Nonfriedi* by Dr. Ohaus who informs me that he possesses four specimens of the first form and five of the second, of which the former are all females and the latter all males, and he has himself suggested in correspondence with me that they may belong to a single species. Confirmatory evidence is supplied by others which I have examined, and which are of the same sexes respectively, with the exception of a single male in M. Oberthür's collection which has the female coloration. Another male in the same collection shows an approximation to that form. As the two forms have been collected together in the same place there can be no doubt as to their being normally sexual. Both exhibit the same velvety surface upon the elytra shown by the whole surface of *P. Westwoodi*, but whereas in the male the ground-colour of the elytra is a reddish-chocolate marked only with two small black spots near the suture, in the female the black has spread over the whole surface leaving only two transverse crescent-shaped marks of the lighter shade. In the male the thorax and scutellum are testaceous and the head only black, and in the female all are black except the thorax at the sides.

The British Museum contains male and female specimens of another new species isolated as regards its claw structure, and apparently representing an intermediate stage in the process by which the peculiar condition characterising the male in the last group has been arrived at. The two sexes are alike except in this respect. The claws of the second and third pairs of legs are divided in both sexes but in the male one claw on each tarsus is thickened, the unguis of the middle feet showing an approximation to its form in the *Westwoodi* group, while the expanded inner anterior claw is like that so common in the males of the *Anomalinae*, to which the present genus shows otherwise few structural resemblances. There is a second male of this species in M. Oberthür's collection.

Parastasia anomala, sp. n.

Elongata, paulo depressa, rufa, capite, scutello, tarsisque (corpore subtus, femoribus tibiisque plus minusve) nigris; capite grosse, prothorace crebre, punctatis, hoc parum convexo antice valde

attenuato ; scutello parvo, subtiliter punctato ; elytris grosse striato-punctatis, punctis tuberculiferis, interstitiis subtilissime punctatis ; pygidio rugoso, cum propygidio, pectore segmentorumque abdominalium marginibus fulvo-hirtis ; pedibus validibus, intermediorum et posteriorum unguibus divisivis.

♂ unguibus exterioribus pedum 4 anticorum lobis internis crassatis. Long. 14 m.m.

Hab. N.W. BORNEO, PENANG.

This species shows a rather deceptive resemblance in size, form and colour to certain males of *P. discolor*, Westw., with which, of course, it has no near relationship. It is easily distinguished by its coarser puncturation, smaller scutellum and hairy pygidium.

A remarkable species from Japan having no close affinity with any other at present known and also dimorphic may be mentioned here. It has been recently described by Herr Nonfried as *Parastasia Ferrieri* and is at once distinguished by the short pubescence with which its entire surface is clothed. The sexes of this insect, of which I have been enabled to examine a considerable series in M. Oberthür's fine collection, show no difference in outward form, but are immediately recognisable by the pygidium, which in the male is red and in the female black. The structure of the claws also differs, that of the latter sex being quite peculiar to this species. The outer claw upon each of the four posterior tarsi is armed with a small tooth at its base in the female, while in the male it is simply divided at the tip. These interesting sexual characteristics were not noticed by Herr Nonfried, nor was another striking peculiarity of the species, namely the form of the hind femora. These are very broad and their upper edge instead of being gently curved is produced into a sharp angle.

I drew up a Latin diagnosis of this species before I had access to Herr Nonfried's description, and as the latter is in German and contains no reference to those characters by which the affinities of the insect may be determined nor to the sexual differences, I shall allow this to remain.

Parastasia Ferrieri, Nonf., Berl. Ent. Zeit., 1895, p. 289.

Fusco-niger, undique fulvo-pubescent, prothorace (margine excepto) maculaque magna utriusque elytri fulvo-rufis ; capite equaliter rugoso, clypei margine fere recto, quadridentato ; prothorace punctato, valde transverso, antice medio parum profunde excavato,

processu mesosternali nullo, scutello punctato, fere semicirculari; elytris brevibus, postice paulo ampliatis, rugose punctato-striatis; pygidio rugoso-punctato; abdominis segmento primo subtus femorumque posteriorum macula obscure rufis, horum margine superiore prope apicem acute angulato. Long 13—17 m.m.

♂ pygidio late rufo, tarsorum mediorum et posticorum unguibus externis apice fassis; ♀ pygidio nigro, nonnunquam linea media obscure rufo, tarsorum mediorum et posticorum unguibus externis basi dente minuto.

Hab. S. JAPAN: Oshima.

It will be seen from this account that sexual dimorphism is almost universal in this genus and the forms which it takes are very varied. In about half the species the claw-structure differs according to sex, but upon no uniform plan, although, contrary to the condition found in the dimorphic insects I have already described belonging to the Anomalinae, the males invariably have the claws more divided when there is a difference. In colouring, whereas in that group the male is almost invariably darker than the female, the reverse again seems usually to occur in *Parastasia*, the female being in many cases quite black while the male is more or less marked with red or yellow. In *P. binotata* however the black female alone possesses light markings, the male, rather lighter in ground-colour, being without them. Other strange sexual characters noticed here are the modified middle tarsus in the male of the group last mentioned, the deep grooves on the elytra of the female *P. canaliculata* and *P. mirabilis*, the sternal process of the latter, the presence of hairs on the pygidium in the females of two species, the peculiar sooty propygidium of others, and the differentiated cephalic horns in the "heterocera group."

These facts show that, whereas, in general, secondary sexual modifications are restricted to the male, in the genus *Parastasia* they occur in about an equal degree in both sexes. As to the meaning of the phenomenon it seems premature as yet to speculate. There is no doubt that it is of much more frequent occurrence than has been generally supposed and that the forms it assumes are more varied than has yet been revealed. Until these are more completely known no explanation can be final. Meanwhile it will be well if entomologists will devote more attention than they have hitherto done to the question of sex.

SYSTEMATIC AND SYNONYMIC TABLE OF SPECIES
EXHIBITING SEXUAL DIMORPHISM.

A. 1st claw only simple in both
sexes

I. No mesosternal process

- P. canaliculata*, Westw.
♂ *bipunctata*, Westw.
rufopicta, Westw.
birmana, sp. n.
basalis, Cand.
sumbarana, Ohaus.
cingala, sp. n.
timoriensis, sp. n.
andamanica, Ohaus.
binotata, Westw.
♂ *Horsfieldi*, Westw.
ephippium, v. Voll.
♂ *niassiana*, Ohaus.

II. Mesosternal process long

- heterocera*, Ohaus.
nitidula, Erichs.
dimidiata, Erichs.
♂ *ometoides (Urleta)*, Westw.

B. Middle and hind claws toothed
in ♀

- Ferrieri*, Nonf.

C. Claws simple in ♀

I. Antennal club long

- melanocephala*, Burm.
dolens, Fairm.
♀ *vitiensis*, Nonf.

II. Antennal club short

(a) Claws cleft at tip in ♂

- confluens*, Westw.
rugosicollis, Bl.
Montargisii
♀ *pilea*, v. Voll.

(b) Claws cleft to base in ♂

1. No mesosternal process

- discolor*, Westw.
scutellaris, Erichs.
unicolor, sp. n.
alternata, sp. n.

2. Mesosternal process in
 ♂ and ♀ *vittata*, v. Voll.
 ♀ *atra*, v. Voll.
Pascoei (*Echmatophorus*),
 Waterh.
3. Mesosternal process in ♀ *mirabilis*, sp. n.
- D. Claws simple in both sexes *Percheroni*, Montr.
Carolinæ, Gestro.
 ? ♀ *Weberi*, Ohaus.
- E. 1st claw simple in ♀ only
 I. 2nd claw not lobed in ♂ *marginata*, Boisd.
Zoraidæ, Gestro.
- II. 2nd claw lobed in ♂ *Westwoodi*, Westw.
sordida, Sharp.
Burmeisteri, Ohaus.
 ♂ *Nonfriedi*, Ohaus.
ruficollis, sp. n.
quinquemaculata, sp. n.
- F. Claws thickened in ♂ *anomala*, sp. n.

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